

SPACE COOPERATION

Observatory Satellites

**Agreement Between the
UNITED STATES OF AMERICA
and JAPAN**

Effected by Exchange of Notes at
Washington November 21, 2014

with

Memorandum of Understanding



NOTE BY THE DEPARTMENT OF STATE

Pursuant to Public Law 89—497, approved July 8, 1966
(80 Stat. 271; 1 U.S.C. 113)—

“ . . . the Treaties and Other International Acts Series issued under the authority of the Secretary of State shall be competent evidence . . . of the treaties, international agreements other than treaties, and proclamations by the President of such treaties and international agreements other than treaties, as the case may be, therein contained, in all the courts of law and equity and of maritime jurisdiction, and in all the tribunals and public offices of the United States, and of the several States, without any further proof or authentication thereof.”

JAPAN

Space Cooperation: Observatory Satellites

*Agreement effected by exchange of notes at
Washington November 21, 2014;
Entered into force November 21, 2014.
With memorandum of understanding.*

November 21, 2014

Excellency:

I have the honor to refer to the recent discussions between representatives of the Government of the United States of America and representatives of the Government of Japan concerning the cooperation between the National Aeronautics and Space Administration of the United States of America (hereinafter referred to as "NASA") on the one hand, and the Ministry of the Environment of Japan (hereinafter referred to as "MOE"), the National Institute for Environmental Studies of Japan (hereinafter referred to as "NIES"), and the Japan Aerospace Exploration Agency (hereinafter referred to as "JAXA") on the other hand, on the joint program among the Greenhouse Gases Observing Satellite (GOSAT), the Orbiting Carbon Observatory-2 (OCO-2) satellite, and the Greenhouse Gases Observing Satellite-2 (GOSAT-2) for the sharing of data products, the cross-calibration and validation of data products, and the formation of

His Excellency
Kenichiro Sasae,
Ambassador of Japan.

DIPLOMATIC NOTE

joint mission science teams (hereinafter referred to as “the Joint Program”), which will be undertaken as a part of the JAXA’s Mid-Term Plan approved by the competent Ministers to achieve the JAXA’s Mid-Term Goal based on the “Basic Plan on Space Policy” of the Government of Japan.

In consideration of the continuing mutually beneficial relationship between the two Governments in the field of peaceful exploration and use of outer space; and taking into account the Agreement between the Government of the United States of America and the Government of Japan on Cooperation in Research and Development in Science and Technology, signed at Toronto on June 20, 1988, as extended and amended; and reaffirming that the provisions of the Agreement between the Government of the United States of America and the Government of Japan Concerning Cross-Waiver of Liability for Cooperation in the Exploration and Use of Space for Peaceful Purposes, signed at Washington on April 24, 1995, and the Exchange of Notes of the same date between the two Governments concerning subrogated claims shall apply to the Joint Program, I have further the honor to propose on behalf of the Government of the United States of America the following arrangements:

1. The cooperation between NASA on the one hand, and MOE, NIES, and JAXA on the other hand, on the Joint Program (hereinafter referred to as "the Cooperation") will be conducted in accordance with the terms and conditions of an implementing arrangement (Memorandum of Understanding) to be agreed upon between NASA on the one hand, and MOE, NIES, and JAXA on the other hand.

2. The Cooperation will be conducted in accordance with the laws and regulations in force in each country and subject to the availability of appropriated funds.

3. NASA on the one hand, and MOE, NIES, and/or JAXA on the other hand will consult with each other on any matter that may arise from or in connection with the Cooperation with a view to finding a mutually acceptable solution. If the matter cannot be resolved through such consultations, consultations between the Government of the United States of America and the Government of Japan shall be held through diplomatic channels with a view to finding a mutually acceptable solution.

4. It is confirmed that the arrangements set forth in the Exchange of Notes dated December 1, 2008, between the two Governments concerning the cooperation on the Joint Program between GOSAT and the Orbiting Carbon Observatory (OCO) satellite, shall be superseded by the present arrangements.

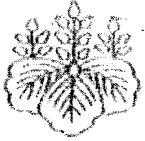
5. The present arrangements shall remain in force for ten years, unless terminated by either Government upon six months' written notice through diplomatic channels of its intention to terminate them. The present arrangements may be extended or amended by mutual written agreement of the two Governments.

I have further the honor to propose that, if the foregoing arrangements are acceptable to the Government of Japan, this note and your note in reply shall constitute an agreement between the two Governments, which shall enter into force on the date of your note in reply.

Accept, Excellency, the renewed assurances of my highest consideration.

For the Secretary of State

A handwritten signature in black ink, appearing to read "A. J. ...", followed by a long horizontal line extending to the right.



EMBASSY OF JAPAN
WASHINGTON, D. C.

Washington, November 21, 2014

Excellency:

I have the honor to acknowledge the receipt of Your Excellency's Note of today's date, which reads as follows:

"Excellency:

I have the honor to refer to the recent discussions between representatives of the Government of the United States of America and representatives of the Government of Japan concerning the cooperation between the National Aeronautics and Space Administration of the United States of America (hereinafter referred to as "NASA") on the one hand, and the Ministry of the Environment of Japan (hereinafter referred to as "MOE"), the National Institute for Environmental Studies of Japan (hereinafter referred to as "NIES"), and the Japan Aerospace Exploration Agency (hereinafter referred to as "JAXA") on the other hand, on the joint program among the Greenhouse Gases Observing Satellite (GOSAT), the Orbiting Carbon Observatory-2 (OCO-2) satellite, and the Greenhouse Gases Observing Satellite-2 (GOSAT-2) for the sharing of data products, the cross-calibration and validation of data products, and the formation of joint mission science teams (hereinafter referred to as "the Joint Program"), which will be undertaken as a part of the JAXA's Mid-Term Plan approved by the competent Ministers to achieve the JAXA's Mid-Term Goal based on the "Basic Plan on Space Policy" of the Government of Japan.

In consideration of the continuing mutually beneficial relationship between the two Governments in the field of peaceful exploration and use of outer space; and taking into account the Agreement between the Government of the United States of America and the Government of Japan on Cooperation in Research and Development in Science and Technology, signed at Toronto on June 20, 1988, as extended and amended; and

reaffirming that the provisions of the Agreement between the Government of the United States of America and the Government of Japan Concerning Cross-Waiver of Liability for Cooperation in the Exploration and Use of Space for Peaceful Purposes, signed at Washington on April 24, 1995, and the Exchange of Notes of the same date between the two Governments concerning subrogated claims shall apply to the Joint Program, I have further the honor to propose on behalf of the Government of the United States of America the following arrangements:

1. The cooperation between NASA on the one hand, and MOE, NIES, and JAXA on the other hand, on the Joint Program (hereinafter referred to as "the Cooperation") will be conducted in accordance with the terms and conditions of an implementing arrangement (Memorandum of Understanding) to be agreed upon between NASA on the one hand, and MOE, NIES, and JAXA on the other hand.

2. The Cooperation will be conducted in accordance with the laws and regulations in force in each country and subject to the availability of appropriated funds.

3. NASA on the one hand, and MOE, NIES, and/or JAXA on the other hand will consult with each other on any matter that may arise from or in connection with the Cooperation with a view to finding a mutually acceptable solution. If the matter cannot be resolved through such consultations, consultations between the Government of the United States of America and the Government of Japan shall be held through diplomatic channels with a view to finding a mutually acceptable solution.

4. It is confirmed that the arrangements set forth in the Exchange of Notes dated December 1, 2008, between the two Governments concerning the cooperation on the Joint Program between GOSAT and the Orbiting Carbon Observatory (OCO) satellite, shall be superseded by the present arrangements.

5. The present arrangements shall remain in force for ten years, unless terminated by either Government upon six months' written notice through diplomatic channels of its intention to terminate them. The present arrangements may be extended or amended by mutual written agreement of the two Governments.

I have further the honor to propose that, if the foregoing arrangements are acceptable to the Government of Japan, this note and your note in reply

shall constitute an agreement between the two Governments, which shall enter into force on the date of your note in reply.

Accept, Excellency, the renewed assurances of my highest consideration."

I have further the honor to confirm on behalf of the Government of Japan that the foregoing arrangements are acceptable to the Government of Japan and to agree that Your Excellency's Note and this Note in reply shall constitute an agreement between the two Governments, which shall enter into force on the date of this reply.

Accept, Excellency, the renewed assurances of my highest consideration.

For the Ambassador Extraordinary
and Plenipotentiary of Japan



His Excellency
John Forbes Kerry
The Secretary of State

MEMORANDUM OF UNDERSTANDING
BETWEEN
THE JAPAN AEROSPACE EXPLORATION AGENCY,
THE NATIONAL INSTITUTE FOR ENVIRONMENTAL STUDIES
OF JAPAN
AND
THE MINISTRY OF THE ENVIRONMENT
OF JAPAN, OF THE ONE PART,
AND
THE NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
OF THE UNITED STATES OF AMERICA, OF THE OTHER PART,
FOR COOPERATION ON
THE GREENHOUSE GASES OBSERVING SATELLITE (GOSAT),
THE ORBITING CARBON OBSERVATORY – 2 (OCO-2), AND
THE GREENHOUSE GASES OBSERVING SATELLITE – 2 (GOSAT-2)
MISSIONS

TABLE OF CONTENTS

PREAMBLE

ARTICLE 1 – PURPOSE

ARTICLE 2 – DEFINITIONS

ARTICLE 3 – MISSION DESCRIPTIONS

ARTICLE 4 – RESPONSIBILITIES

ARTICLE 5 – RIGHTS IN RESULTING DATA

ARTICLE 6 – POINTS OF CONTACT

ARTICLE 7 – FINANCIAL ARRANGEMENTS

ARTICLE 8 – LIABILITY AND RISK OF LOSS

ARTICLE 9 – TRANSFER OF GOODS AND TECHNICAL DATA

ARTICLE 10 – INTELLECTUAL PROPERTY RIGHTS

ARTICLE 11 – RELEASE OF RESULTS AND PUBLIC INFORMATION

ARTICLE 12 – EXCHANGE OF PERSONNEL AND ACCESS TO FACILITIES

ARTICLE 13 – CUSTOMS CLEARANCE AND MOVEMENT OF GOODS

ARTICLE 14 – OWNERSHIP OF EQUIPMENT

ARTICLE 15 – MISHAP INVESTIGATION

ARTICLE 16 – CONSULTATION AND DISPUTE RESOLUTION

ARTICLE 17 – AMENDMENTS

ARTICLE 18 – ENTRY INTO FORCE, TERM AND TERMINATION

PREAMBLE

The Japan Aerospace Exploration Agency (JAXA), the National Institute for Environmental Studies of Japan (NIES), and the Ministry of the Environment of Japan (MOE) (hereinafter jointly referred to as the "Japan Agencies"), of the one part, and the National Aeronautics and Space Administration (NASA) of the United States of America, of the other part (hereinafter individually referred to as a "Party" and jointly referred to as the "Parties");

RECOGNIZING that Earth observation from space represents a critical element in the worldwide investigation of global environmental issues;

DESIRING to extend their cooperation developed in exploration and the use of space for peaceful purposes;

DESIRING to observe, monitor, and study the Earth's surface and atmosphere from space;

RECALLING the Agreement between the Government of the United States of America and the Government of Japan Concerning Cross-Waiver of Liability for Cooperation in the Exploration and Use of Space for Peaceful Purposes of April 24, 1995 (hereinafter referred to as the "Cross-Waiver Agreement"), the Exchange of Notes of the same date between the Government of the United States of America and the Government of Japan concerning subrogated claims and the Agreed Minutes of December 8, 2000, concerning the Cross-Waiver Agreement;

RECALLING that Joint Program between the Greenhouse Gases Observing Satellite (GOSAT) and Orbiting Carbon Observatory (OCO) is listed in the Annex of the Cross-Waiver Agreement as of December 1, 2008;

RECALLING that the Memorandum of Understanding between JAXA and NASA for Cooperation between GOSAT and OCO satellites of February 23, 2009 (hereinafter referred to as the "JAXA-NASA MOU for GOSAT and OCO"), was signed to initiate cooperation between OCO and GOSAT;

RECOGNIZING that GOSAT has achieved its mission target in collaboration with OCO-2 team (formerly the Atmospheric CO₂ Observations from Space team), and that the effectiveness of greenhouse gases observations from space has been demonstrated by the results of GOSAT observations;

RECOGNIZING that the Japan Agencies are developing GOSAT-2 as a joint project under an arrangement among JAXA, NIES, and MOE concerning GOSAT-2;

RECOGNIZING that NASA is operating the OCO-2 mission to make space-based measurements of atmospheric carbon dioxide to characterize the geographic

distribution of carbon dioxide sources and sinks and to quantify their variability over annual cycles; and

PURSUANT to the Exchange of Notes between the Government of Japan and the Government of the United States of America, dated November, 21, 2014, concerning cooperative activities related to the GOSAT, OCO-2, and GOSAT-2 missions, hereinafter referred to as the "Exchange of Notes,"

Have agreed to the provisions of this Memorandum of Understanding, hereinafter referred to as the "MOU," as follows:

ARTICLE 1 – PURPOSE

The GOSAT, OCO-2, and GOSAT-2 missions (hereinafter jointly referred to as "3 CO₂ Missions") are elements of the Global Earth Observation System of Systems, and their measurements are expected to improve the understanding of the processes that regulate atmospheric carbon dioxide, enabling more reliable forecasts of carbon dioxide buildup and its impacts on climate change. GOSAT and GOSAT-2 contribute to Japan's implementation of the United Nations Framework Convention on Climate Change.

The purpose of this MOU is to establish the terms and conditions under which the Parties will cooperate on activities involving the 3 CO₂ Missions. This MOU supersedes and terminates the JAXA-NASA MOU for GOSAT and OCO.

ARTICLE 2 – DEFINITIONS

1. For the purpose of this MOU, with the exception of Article 8 (Liability and Risk of Loss), the term "Related Entity" means:
 - A. A contractor or subcontractor of a Party at any tier;
 - B. A grantee or any other cooperating entity or investigator of a Party at any tier; or
 - C. A contractor or subcontractor of a grantee or any other cooperating entity or investigator of a Party at any tier.
2. In Article 9 (Transfer of Goods and Technical Data), the term "Related Entity" may also include another State or an agency or institution of another State, where such State, agency, or institution is an entity described above or is otherwise involved in the activities undertaken pursuant to this MOU.

ARTICLE 3 – MISSION DESCRIPTIONS

Greenhouse gases Observing SATellite (GOSAT)

The Greenhouse Gases Observing Satellite, GOSAT (nicknamed “Ibuki”) was developed jointly by JAXA, NIES, and MOE. The GOSAT Project Team consists of scientists and engineers at JAXA and NIES. GOSAT was successfully launched on January 23, 2009, and began routine science operations in June of that year. The spacecraft flies in a 666 km altitude, 98° inclination, sun-synchronous orbit with a 12:49 PM nodal crossing time and a three-day (44-orbit) ground track repeat cycle. The satellite carries two instruments. The primary CO₂ instrument is the Thermal And Near infrared Sensor for carbon Observations-Fourier Transform Spectrometer (TANSO-FTS). The second instrument is the TANSO Cloud and Aerosol Imager (TANSO-CAI), a moderate spatial resolution and wide field of view angle imager designed to facilitate the detection of clouds and optically thick aerosols within the TANSO-FTS field of view.

Orbiting Carbon Observatory - 2 (OCO-2)

The Orbiting Carbon Observatory - 2 (OCO-2) is a replacement for the Earth System Science Pathfinder (ESSP) Orbiting Carbon Observatory (OCO) mission, which was lost in February 2009, when its launch vehicle malfunctioned and failed to reach orbit. NASA selected the Jet Propulsion Laboratory, California Institute of Technology (JPL/Caltech) to implement the OCO-2 mission, based on the OCO mission design. OCO-2 was launched from Vandenberg Air Force Base in California on July 2, 2014. The observatory flies in a 705 km altitude, near-polar, sun synchronous orbit, at the head of the Afternoon Constellation (A-Train). This 98.8-minute orbit has a 1:30 PM nodal crossing time and a 16-day (233-orbit) ground-track repeat cycle. The OCO-2 spacecraft carries and points a three-channel, high-resolution, imaging grating spectrometer that measures reflected sunlight in the O₂ A-band at 0.76 μm and in the two CO₂ bands centered near 1.61 and 2.06 μm. These three absorption bands overlap the short-wave infrared (SWIR) channels used by the GOSAT TANSO-FTS, but should complement those measurements with improved coverage, resolution, and sensitivity.

Greenhouse gases Observing SATellite - 2 (GOSAT-2)

The Japan Agencies are formulating a follow-on mission for GOSAT, called GOSAT-2. This mission is envisioned as a transitional satellite between the pioneering GOSAT mission and a future operational space-based greenhouse gas monitoring capability. The goal for GOSAT-2 is to provide monthly XCO₂ estimates with precisions of 0.5 ppm on spatial scales of 500 km over the land. This will require improved measurement sensitivity and accuracy together with increasing the quantity of useful data by orienting the line of sight to avoid clouds. In addition, contributions to air pollution issues by GOSAT-2 are envisioned. To meet these objectives, GOSAT-2 will carry more advanced versions of the TANSO-FTS and TANSO-CAI instruments carried by GOSAT. GOSAT-2 is expected to operate in a near-polar, sun-synchronous orbit with a ground-track repeat cycle of six days, similar to that currently being used by GOSAT.

ARTICLE 4 – RESPONSIBILITIES

To implement this MOU, the Japan Agencies and NASA will use reasonable efforts to carry out the following responsibilities:

1. Cross-calibrate the pre-launch radiometric, spectroscopic, and geometric performance of the instruments on the 3 CO₂ Missions by:
 - a. Sharing technical insight into the pre-flight instrument characterization and calibration requirements, methods, equipment, and their tractability to internationally recognized standards;
 - b. Exchanging the radiometric calibration standards used for pre-launch instrument calibration; and
 - c. Holding workshops and technical interface meetings to exchange and jointly evaluate pre-launch calibration data.
2. Implement the following activities to ensure the stability of the on-orbit calibration of the instruments on the 3 CO₂ Missions:
 - a. Collaborating in joint, ground-based vicarious calibration campaigns; and
 - b. Holding semi-annual technical interface meetings to analyze the results from the vicarious calibration campaigns and exchange:
 - i. Ground-based and space-based spectra of CO₂ and O₂ collected over common vicarious calibration sites;
 - ii. Spectrally dependent solar and lunar irradiance standards used to calibrate the flight instruments;
 - iii. Spectrally dependent observations of solar and lunar irradiances acquired at the top of the atmosphere by the space-based instruments; and
 - iv. Lunar reflectance models and ground-based lunar observation data for validation of lunar reflectance models.
3. Conduct semi-annual technical interface meetings to compare the relative performance of the methods used to retrieve XCO₂ and other science data products including carbon flux from the space-based measurements collected by the 3 CO₂ Missions and exchange:
 - a. Technical descriptions of the science data products that will be retrieved from the space-based measurements and archived for distribution to the science community, along with their uncertainties;
 - b. Retrieval algorithm theoretical basis documents describing the methods used to retrieve science data products from the space-based measurements including the background, the quality assessment plan, the validation plan, data dependency and other limitations of the methods;
 - c. The input atmospheric and surface state properties and other environmental information, to the extent to be granted by the owner(s)

- of such information, used in the retrieval algorithms, discriminating which variables are assumed to be fixed from those that are optimized as part of the retrieval process;
- d. Spectral databases of the gas absorption cross-sections for O₂, CO₂, and other gases used in the data product retrieval algorithms, to facilitate inter-comparisons of XCO₂ estimates and other products retrieved from spectra collected by the 3 CO₂ Missions; and
 - e. Standard test cases based on simulated spectra and subsets of space-based measurements that can be used to perform retrieval algorithm intercomparison experiments to assess the relative performance of the retrieval algorithms.
4. Implement a common validation approach during the overlapping operational phases of two or more of the 3 CO₂ Missions and conduct semi-annual technical interface meetings to relate the XCO₂ estimates and other science data products including carbon fluxes retrieved from space-based measurements to each other, to the World Meteorological Organization (WMO) in situ CO₂ standard, and other internationally recognized standards by exchanging and comparing:
- a. Space-based measurements and retrieved science data products for nearly simultaneous, spatially coincident soundings acquired by two or more operating satellites;
 - b. Soundings collected in the vicinity of Total Carbon Column Observing Network (TCCON) sites;
 - c. Ground-based spectra and science data products derived from measurements acquired by TCCON stations for which the Japan Agencies and NASA are directly responsible; and
 - d. Ground-based, shipborne, and/or airborne validation instruments to secure consistency among the validation data acquired independently by a Party.
5. Establish a joint mission science team consisting of representatives from each of the 3 CO₂ Missions' science teams and convene annual joint mission science team meetings to coordinate the calibration, retrieval algorithm implementation, data products validation and carbon flux inversion activities to fully exploit the data from the 3 CO₂ Missions and make joint presentations at international conferences and workshops.
6. Conduct joint presentations in international conferences such as those convened under the United Nations Framework Convention on Climate Change.

ARTICLE 5 – RIGHTS IN RESULTING DATA

The Japan Agencies and NASA will make the data described in Article 4 (Responsibilities) available to each other as soon as such data become available.

The Parties will comply with the respective data policy of each mission providing such data. All jointly derived data products, which are data products derived by NASA from the ones processed by the Japan Agencies and data products derived by the Japan Agencies from the ones processed by NASA in the course of carrying out responsibilities described in Article 4 (Responsibilities), will be made freely and openly available via the internet. No additional agreements or licenses will be required between the Parties, which may also include OCO-2 mission science team or NASA's consigned researchers, with whom NASA will take necessary measures and ensure to comply with the term and condition of this MOU, for the exchange of the data described in Article 4 (Responsibilities), or for the distribution of jointly derived data products.

ARTICLE 6 – POINTS OF CONTACT

The NASA Point of Contact for this MOU will be:

Dr. Kenneth Jucks
Program Scientist, OCO-2 and OCO-3 Missions
Earth Science Division, Science Mission Directorate
NASA Headquarters
300 E Street, SW
Washington, DC 20546
USA
Phone: +1-202-358-0476
E-mail: kenneth.w.jucks@nasa.gov

The JAXA Point of Contact for this MOU will be:

Mr. Masakatsu Nakajima
Mission Manager
Greenhouse Gases Observing Satellite-2 Project Team
Japan Aerospace Exploration Agency (JAXA)
2-1-1, Sengen, Tsukuba, Ibaraki, 305-8505,
JAPAN
Phone: +81-50-3362-6130
E-mail: nakajima.masakatsu@jaxa.jp

The NIES Point of Contact for this MOU will be:

Dr. Tsuneo Matsunaga
Leader, NIES GOSAT-2 Project
Center for Global Environmental Research
National Institute for Environmental Studies
16-2 Onogawa, Tsukuba, Ibaraki, 305-8506,
JAPAN

Phone: +81-29-850-2838

E-mail: matsunag@nies.go.jp

The MOE Point of Contact for this MOU will be:

Dr. Takuya Nomoto

Deputy Director, Research and Information Office,

Global Environment Bureau,

Ministry of the Environment of Japan

Daido Seimei Kasumigaseki Bldg. 17F,

1-4-2, Kasumigaseki, Chiyoda-Ku, Tokyo, 100-0013,

JAPAN

Phone: +81-3-5521-8247

E-mail: TAKUYA_NOMOTO@env.go.jp

Any change in contact information will be communicated in writing between the Parties.

ARTICLE 7 – FINANCIAL ARRANGEMENTS

1. The Japan Agencies and NASA will bear the costs of discharging their respective obligations under this MOU, including travel and subsistence of personnel and transportation of all equipment and other items for which they are responsible.
2. The obligations under this MOU are subject to the availability of appropriated funds and the respective funding procedures of the Japan Agencies and NASA. Should any of the Japan Agencies or NASA encounter budgetary problems that may affect the activities to be carried out under this MOU, the Party encountering the problems will notify and consult with the other Party as soon as possible.

ARTICLE 8 – LIABILITY AND RISK OF LOSS

1. The Cross Waiver Agreement, the Exchange of Notes of the same date between the Governments of Japan and the United States of America concerning subrogated claims and the Agreed Minutes of December 8, 2000, concerning the Cross-Waiver Agreement, will apply to activities under this MOU.

ARTICLE 9 – TRANSFER OF GOODS AND TECHNICAL DATA

The Parties are obligated to transfer only those technical data (including software) and goods necessary to fulfill their respective responsibilities under this MOU, in accordance with the following provisions, notwithstanding any other provisions of this MOU:

1. All activities under this MOU will be carried out in accordance with the national laws and regulations of Japan and the United States of America, including those laws and regulations pertaining to export control.
2. The transfer of technical data for the purpose of discharging the Parties' responsibilities with regard to interface, integration, and safety will normally be made without restriction, except as required by paragraph 1, above.
3. All transfers of goods and proprietary or export-controlled technical data are subject to the following provisions:
 - A. In the event a Party or its Related Entity finds it necessary to transfer such goods or data, for which protection is to be maintained, such goods will be specifically identified and such data will be marked;
 - B. The identification for such goods and the marking on such data will indicate that the goods and data will be used by the receiving Party and its

Related Entities only for the purposes of fulfilling the receiving Party's or Related Entities' responsibilities under this MOU and that such goods and data will not be disclosed or retransferred to any other entity without the prior written permission of the furnishing Party;

- C. The receiving Party and its Related Entities will abide by the terms of the notice and protect any such goods and data from unauthorized use and disclosure; and
 - D. The Parties to this MOU will cause their Related Entities to be bound by the provisions of this Article through contractual mechanisms or equivalent measures.
4. All goods exchanged in the performance of this MOU will be used by the receiving Party or its Related Entity exclusively for the purposes of this MOU. Upon completion of the activities under this MOU, the receiving Party or its Related Entity will return or otherwise dispose of all goods and marked proprietary or export-controlled technical data provided under this MOU, as directed by the furnishing Party or its Related Entity.

ARTICLE 10 – INTELLECTUAL PROPERTY RIGHTS

1. Nothing in this MOU will be construed as granting, either expressly or by implication, to the other Party any rights to, or interest in, any inventions or works of a Party or its Related Entities made prior to the entry into force of, or outside the scope of, this MOU, including any patents (or similar forms of protection in any country) corresponding to such inventions or any copyrights corresponding to such works.
2. Any rights to, or interest in, any invention or work made in the performance of this MOU solely by one Party or any of its Related Entities, including any patents (or similar forms of protection in any country) corresponding to such invention or any copyright corresponding to such work, will be owned by such Party or Related Entity. Allocation of rights to, or interest in, such invention or work between such Party and its Related Entities will be determined by applicable laws, rules, regulations, and contractual obligations.
3. It is not anticipated that there will be any joint inventions made in the performance of this MOU. Nevertheless, in the event that an invention is jointly made in the performance of this MOU, the Parties will, in good faith, consult and agree within 30 calendar days as to:
 - A. The allocation of rights to, or interest in, such joint invention, including any patents (or similar forms of protection in any country) corresponding to such joint invention;

- B. The responsibilities, costs, and actions to be taken to establish and maintain patents (or similar forms of protection in any country) for each such joint invention; and
 - C. The terms and conditions of any license or other rights to be exchanged between the Parties or granted by one Party to the other Party.
- 4. For any jointly authored work by the Parties, should the Parties decide to register the copyright in such work, they will, in good faith, consult and agree as to the responsibilities, costs, and actions to be taken to register copyrights and maintain copyright protection (in any country).
 - 5. Subject to the provisions of Article 9 (Transfer of Goods and Technical Data) and Article 11 (Release of Results and Public Information), each Party will have an irrevocable royalty-free right to reproduce, prepare derivative works, distribute, and present publicly and authorize others to do so on its behalf, any copyrighted work resulting from activities undertaken in the performance of this MOU for its own purposes, regardless of whether the work was created solely by, or on behalf of, the other Party or jointly with the other Party.

ARTICLE 11 – RELEASE OF RESULTS AND PUBLIC INFORMATION

- 1. The Parties retain the right to release public information regarding their own activities under this MOU. The Parties will coordinate with each other in advance concerning releasing to the public information that relates to the other Party's responsibilities or performance under this MOU.
- 2. The Parties will make the results available to the general scientific community, as appropriate and agreed between the Parties, in a timely manner.
- 3. The Parties acknowledge that the following data or information does not constitute public information and that such data or information will not be included in any publication or presentation by a Party under this Article without the other Party's prior written permission:
 - A. Data furnished by a Party in accordance with Article 9 (Transfer of Goods and Technical Data) which is identified as export-controlled or proprietary; or
 - B. Information about an invention of a Party before an application for a patent (or similar form of protection in any country) corresponding to such invention has been filed covering the same or a decision not to file has been made.

ARTICLE 12 – EXCHANGE OF PERSONNEL AND ACCESS TO FACILITIES

1. To facilitate implementation of the activities conducted under this MOU, the Parties may support the exchange of a limited number of personnel, including contractors and subcontractors, from each Party, at an appropriate time and under conditions mutually agreed between the Parties.
2. Access by the Parties to each other's facilities or property, or to each other's Information Technology (IT) systems or applications, is contingent upon compliance with each other's respective security and safety policies and guidelines including, but not limited to: standards on badging, credentials, and facility and IT system application/access.

ARTICLE 13 – CUSTOMS CLEARANCE AND MOVEMENT OF GOODS

1. In accordance with the laws and regulations of Japan and the United States of America, each Party will facilitate free customs clearance and waiver of all applicable customs duties and taxes for goods necessary for the implementation of this MOU. In the event that any customs duties or taxes of any kind are nonetheless levied on such equipment and related goods, such customs duties or taxes will be borne by the Party(ies) of the country levying such customs duties or taxes.
2. In accordance with its laws and regulations, each of the Parties will also facilitate the movement of goods into and out of the territory of the Party's country as necessary to comply with this MOU.

ARTICLE 14 – OWNERSHIP OF EQUIPMENT

Unless otherwise agreed in writing, each Party will retain ownership of all equipment, including the goods, hardware, software, and associated technical data, it provides to the other Party under the terms of this MOU, without prejudice to any individual rights of ownership of the Parties' respective Related Entities. To the extent feasible and recognizing that equipment sent into space or integrated into another Party's equipment cannot be returned, each Party agrees to return the other Party's equipment in its possession at the conclusion of activities under this MOU.

ARTICLE 15 – MISHAP INVESTIGATION

In the case of a mishap, the Parties agree to provide assistance to each other in the conduct of any investigation, bearing in mind, in particular, the provisions of Article 9 (Transfer of Goods and Technical Data). In the case of activities that might result in the death of or serious injury to persons or substantial loss of or damage to property as a result of activities under this MOU, the Parties agree to establish a process for investigating each such mishap.

ARTICLE 16 – CONSULTATION AND DISPUTE RESOLUTION

The Parties agree to consult promptly with each other on all issues involving interpretation, implementation, or performance of this MOU. Such issues will first be referred to the appropriate points of contact named above for the Japan Agencies and NASA. If they are unable to come to an agreement, then the issues will be referred to the NASA Administrator, the Minister of Environment, the JAXA President, and the Director of NIES, or their designated representatives, for joint resolution.

ARTICLE 17 – AMENDMENTS

This MOU may be amended by mutual written agreement of the Parties.

ARTICLE 18 – ENTRY INTO FORCE, TERM AND TERMINATION

1. This MOU will enter into force upon signature by the Parties and will remain in force until November 20, 2024, unless extended by mutual written agreement, provided that the Exchange of Notes remains in force.
2. Either Party may terminate this MOU at any time upon giving at least six months' prior written notice to the other Party of its intent to terminate. In the event of termination, the Parties will endeavor to minimize any negative impacts of such termination on each other. Termination of this MOU will not affect a Party's continuing obligations under the following Articles of this MOU: Rights in Resulting Data, Transfer of Goods and Technical Data, Intellectual Property Rights, Liability and Risk of Loss, and Customs Clearance and Movement of Goods, unless otherwise agreed.

IN WITNESS WHEREOF, the undersigned duly authorized representatives of the Parties have signed this MOU, in four originals, in the English language.

FOR THE NATIONAL AERONAUTICS
AND SPACE ADMINISTRATION OF

THE UNITED STATES OF AMERICA:



DATE: 17 MARCH 2015

PLACE: Tokyo, JAPAN

FOR THE MINISTRY OF
THE ENVIRONMENT OF JAPAN:



DATE: 17 March 2015

PLACE: Tokyo, Japan

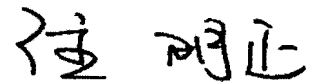
FOR THE JAPAN
AEROSPACE
EXPLORATION AGENCY:



DATE: 17 March 2015

PLACE: Tokyo, Japan

FOR THE NATIONAL
INSTITUTE FOR
ENVIRONMENTAL
STUDIES OF JAPAN:



DATE:

17 March 2015

PLACE:

Tokyo Japan